

CLAIMS

What is claimed is:

- 1 1. A method of performing a longest match search comprising:
2 receiving a search key;
3 determining a set of masks that when applied to the search key are known to have
4 a potential for matching an entry in a routing table;
5 forming a routing table query based upon the search key and a longest mask of the
6 set of masks; and
7 applying the routing table query to the routing table.
- 1 2. The method of claim 1, further comprising:
2 removing the longest mask from the set of masks; and
3 continuing to apply additional routing table queries until either the set of masks is
4 empty or a matching entry is found in the routing table.
- 1 3. The method of claim 1, wherein the search key comprises an Internet Protocol (IP)
2 address.
- 1 4. The method of claim 3, wherein the IP address comprises a destination address.
- 1 5. The method of claim 3, wherein the IP address comprises a source address.
- 1 6. The method of claim 1, wherein said determining a set of masks comprises
2 retrieving an encoded mask vector from a mask table based upon the search key,
3 the encoded mask vector having N bits and capable of identifying N different
4 length masks.

- 1 7. The method of claim 1, wherein the longest mask of the set of masks is
2 determined by the following equation: $\text{Mask} = (0 - \text{MaskWord}) \mid \text{MaskWord}$,
3 where:
4 MaskWord is an encoded mask vector, and
5 Mask is the longest mask identified by MaskWord.
- 1 8. A packet forwarding device comprising:
2 a plurality of ports upon which packets are received and transmitted;
3 a routing processor coupled to the plurality of ports to determine an egress port of
4 the plurality of ports for a packet received on an ingress port of the
5 plurality of ports by performing a longest match search comprising one or
6 more routing table queries;
7 a routing table, coupled to the routing processor, to provide the routing processor
8 with a match indication and information regarding a matching routing
9 table entry, if any, of a plurality of routing table entries stored therein in
10 response to a routing table query; and
11 a mask table, coupled to the routing processor, to maintain encoded mask vectors
12 identifying mask lengths of the plurality of routing table entries.
- 1 9. The packet forwarding device of claim 8, the encoded mask vectors comprise N-
2 bits and are capable of representing N different masks.
- 1 10. The packet forwarding device of claim 8, wherein the routing table comprises a
2 Content Addressable Memory (CAM).

1 11. The packet forwarding device of claim 8, wherein the one or more routing table
2 queries are formed by applying a series of masks determined with reference to the
3 mask table to a search key extracted from the received packet.

1 12. A method of forwarding a packet comprising:
2 receiving a packet on an ingress port of a plurality of ports;
3 extracting a destination Internet Protocol (IP) address from a header of the packet;
4 using a portion of the destination IP address to index into a mask table to retrieve
5 an encoded mask vector that identifies a series of masks to be applied to
6 the destination IP address during a longest match search of a routing table,
7 the series of masks representing those masks that are known to have a
8 potential for matching an entry in the routing table when applied to the
9 destination IP address;
10 identifying a longest matching entry in the routing table by performing the longest
11 match search based upon the destination IP address and one or more of the
12 series of masks; and
13 forwarding the packet to a network device associated with the destination IP
14 address via an egress port of the plurality of ports identified by the longest
15 matching entry.

1 13. The method of claim 12, wherein the portion of the destination IP address
2 comprises the most significant N bits of the destination IP address.

1 14. The method of claim 12, wherein the encoded mask vector includes a plurality of
2 mask length indicator bits that each indicate a mask length by virtue of their
3 position within the encoded mask vector.

1 15. The method of claim 12, further comprising updating the mask table to include a
2 new encoded mask vector in response to receiving a new routing table entry.

1 16. A machine-readable medium having stored thereon data representing sequences of
2 instructions, the sequences of instructions which, when executed by a processor,
3 cause the processor to:
4 receive a search key;
5 determine a set of masks that when applied to the search key are known to have a
6 potential for matching an entry in a routing table;
7 form a routing table query based upon the search key and a longest mask of the set
8 of masks; and
9 apply the routing table query to the routing table.

1 17. The machine-readable medium of claim 16, wherein the longest mask of the set of
2 masks is determined by the following equation: $\text{Mask} = (0 - \text{MaskWord}) |$
3 MaskWord ,
4 where:
5 MaskWord is an encoded mask vector, and
6 Mask is the longest mask identified by MaskWord .

1 18. The machine-readable medium of claim 16, wherein the set of masks is
2 determined by retrieving an encoded mask vector from a mask table based upon

- 3 the search key, the encoded mask vector having N bits and capable of identifying
- 4 N different length masks.